strong was the convection that apparently the upward moving air was carried considerably beyond the level of equilibrium. It would soon descend and spread out around the column of rising air. The descent produced not only the mammato-cumulus forms, which in this connection were unusually large, but also certain reactions in the top of the cloud sheet near by. Rain began at 6:15 p. m. with some electric display and continued as a moderate shower for 35 minutes with a light wind. About 6:45 p. m. thunder became loud and close and a scroll of heavy dark cloud appeared rolling down from the northwest. Excessive rain began at 6:50 and lasted 25 minutes. Small hail, about the size of peas, fell from 6:50 to 6:53 and the lightning became severe. The large hail fell from 8:05 to 8:10. Melon and cucumber leaves were cut in some cases with nearly round holes. Path of storm northwest-southeast, last thunder heard southeast about 7:40.

Two humps appeared on each side of the falling center, about ½ to 1 km. from it. The hump on the east grew to a new knob and then fell back to a level. This rise and fall took about five minutes.

Another knob grew, but still farther east, and fell back. Then still another arose immediately west of this position. This last knob was about 1 km. wide and ⅓–½ km. high. This formation of protuberances in one place and then another, which seemed to be chiefly the result of the oscillation following the first large one, occupied a period of 25 minutes.

Thereafter, the storm had so decreased in intensity with the oncoming of night and had moved so far away that no further action was seen.

Intense thunder and hailstorm at Bridgehampton, Long Island.—About 50 miles farther east another small local storm struck Bridgehampton, on Long Island, at this time. Intense local convection was evidently the order of the evening. Ernest S. Clowes, writing from that place, said it was one of the most severe he had seen in several years' residence there. The following is from his letter, with times changed from daylight saving to eastern standard.

> Its distinguishing feature was hail, always a great rarity here, which fell for about five minutes, the stones mostly measuring up to ¾ inch to 1 inch in thickness, the lower figure being more common. Some jagged pieces of ice fell, one of which was reported as being 2 inches long, the measurement being made by ruler soon after the fall.

NOTES, ABSTRACTS, AND REVIEWS

Extreme July weather indicates August weather.—Five times during the last 58 years in Iowa the State mean temperature for July has been 4° or more above normal, and in every case the mean temperature of August has been above normal; also there have been 3 cases when the July mean was 4° or more below normal and in each case the August mean was below normal, so extreme July temperatures have been followed by the same tendency in August 100 per cent of the time.

As to rainfall, there have been 8 cases in 58 years when the State average rainfall for July was 2 inches or more above normal and in 6 of the 8 cases, or 75 per cent, the average rainfall of the following August was above normal; also there were 6 cases when the average rainfall of July was 2 inches or more below normal and in 5 out of the 6 cases, or 83 per cent, the average rainfall of the following August was below normal.

Briefly, there seems to be a well-marked tendency for abnormal Iowa weather in July to perpetuate itself through August. In other Corn Belt States this weather sequence is not so well defined, though Missouri shows a tendency in that direction.—*C. D. R.*

Iowa July mean temperatures 4° or more from normal (8 cases) and average rainfall 2 inches or more from normal (14 cases) in 58 years, 1873–1930; and departures from normal in the following August

Temperature			Rainfall		
Year	July	Aug.	Year	July	Aug.
	°	°		Inches	Inches
1874	+4.1	+2.6	1875	+2.22	+0.60
1901	+8.7	+2.1	1876	+2.32	+1.71
1916	+6.0	+2.3	1896	+3.07	+.08
1921	+4.2	+.4	1900	+2.32	+1.21
1930	+4.2	+2.7	1902	+4.84	+3.14
1882	−4.6	−.2	1907	+3.44	+.89
1891	−5.2	−2.6	1915	+4.49	−.63
1915	−4.2	−5.8	1922	+2.48	−.38
			1886	−3.33	−1.42
			1894	−3.20	−1.86
			1913	−2.01	−.76
			1916	−2.05	−.86
			1923	−2.08	+1.98
			1930	−2.34	−1.02

Pleistocene of northern Kentucky and other papers.—This volume, put out by Dr. W. R. Jillson, State geologist of Kentucky, contains contributions by Frank Leverett on The Pleistocene of Northern Kentucky; The Climate of Kentucky, by S. S. Visher; Geology of the Southern part of the Dawson Triangle, by A. H. Sutton; The Cretaceous Deposits of Trigg, Lyon, and Livingston Counties of Kentucky, by J. K. Roberts; and the Geology and Physiography of the Mammoth Cave National Park. The preface is by the late T. C. Chamberlin.

Kentucky's position near the southern border of the glacial drift makes a study of the distribution of scattered bowlders and other evidence of glacial action beyond the border of continuous drift of special interest to students of the glacial history of our continent.

The chapter on climate by Dr. S. S. Visher covers 86 pages and is fully illustrated by 109 maps and diagrams. The statistical presentation is based on the records of 72 stations well distributed throughout the State for the period from the beginning of observations to 1922, inclusive. The length of record varies, therefore, from 63 at Lexington to 5 at Lynnville; the great majority of records, however, are more than 10 years in length.

Table No. 3 gives statistics of irregularities in the occurrence of precipitation. The following is abstracted from that table: Number of stations used, 72. The wettest year in Kentucky, as determined by the record of individual stations, was 1890, with 11 stations, or but 15 per cent of the total so reporting; the next wettest was 1919, with 14 per cent. The driest year was 1904, with 24 stations, or 33 per cent of the total, so reporting; the next driest was 1901, a year characterized by great heat and dryness in the great interior valleys. That year had but 12 stations, or 14 per cent of the total reporting the greatest drought of record.

The extremely local character of rainfall distribution may be realized when it is considered that for the 40-year period 1883–1922 one or more stations experienced the greatest rainfall in the life of the station in 25 of the 40 years, or in 62 per cent of the years—that is to say, some 1 of the 72 stations recorded the greatest rainfall during its life in one of the years considered and only 11 of the stations recorded their heaviest precipitation in the same year.

Dry years, as is well known, occur with more frequency than wet ones, as illustrated by the number of stations, 24, that reported great dryness in 1904 and 1901. A comparison with the great drought of 1930 is, of course, not yet possible.—*A. J. H.*

The diurnal variation of the rainfall at Paris [1]—The diurnal variation of the rainfall has, until now, been studied very little in France. It is interesting from a theoretical point of view and also for purposes of weather forecasting.

The object of this note is to set forth the principal results of the discussion of 20 years of observations made at the Observatory of Montsouris from 1907 to 1926. The data to be utilized are:

1. The number of times it was raining at 3^h, 6^h, 9^h, . . . 24^h.
2. The duration of the rainfall from 0^h to 3^h, from 3^h to 6^h, from 6^h to 9^h, . . . from 21^h to 24^h.
3. The depth of water collected.
4. The number of times when it was raining within these same intervals of time.

From the numbers of times of rainfall at the different hours one deduces immediately the corresponding probabilities of rainfall, which are indicated in the following table.

Probability of rainfall at the different hours (in thousandths)

	3^h	6^h	9^h	12^h	15^h	18^h	21^h	24^h	Mean
Year	65	69	56	57	60	65	61	53	61
Oct.-Mar	82	88	76	74	77	81	74	66	77
Apr.-Sept	48	49	36	39	43	50	48	40	44
Wind W-N	81	81	52	56	49	51	49	42	58
Wind N-E	32	32	29	26	29	25	28	22	28
Wind E-S	41	45	44	43	57	70	65	59	53
Wind S-W	84	93	82	84	93	105	96	84	90

The mean diurnal variation, in winter as in summer, exhibits, as we already know, two maxima and two minima; but if the directions of the wind are noted, which to our knowledge has not been done, we see that this double oscillation is due to the blending of two distinct types of variation.

The diurnal variations relating to winds of west to north and of north to east are much alike; they are characterized by the probability of rain of relatively great amount between 3^h and 6^h, and of small amount the rest of the time, with no indication of a secondary maximum in the afternoon.

For the winds from east to south and south to west the diurnal variations are still more alike, and entirely different from the preceding ones; the probability of rain is great between noon and midnight and small between midnight and noon, with a very secondary relative maximum about 6^h.

The mean duration of the rainfall in each 3-hour interval being proportional to the mean probability of the rainfall in the same interval, the studies of the duration served only to confirm the above results; we are not discussing them here.

By dividing the amount of water collected by the duration of the downpour, the intensity of the rainfall has been obtained. The diurnal variation in this element has only one maximum and one minimum and gives about the same result for each wind direction.

Furthermore, taking the relation of the duration to the number of occasions of rainfall, we have a measure of the tendency of the rainfall to persist. The diurnal variation of this ratio has, like the others, a simple oscillation independent of the wind direction. It is almost inverse of that of the intensity. For lack of space we can not give, for each of these elements, more than the mean annual variation.

	0^h-3^h	3^h–6^h	6^h–9^h	9^h–12^h	12^h–15^h	15^h-18^h	18^h–21^h	21^h–24^h
Intensity of rainfall in hundredths of millimeters at the hour: Year	97	90	92	107	145	137	115	96
Degree of persistence of rainfall in hundredths of hours for times of rainfall: Year	119	122	112	96	89	94	107	115
Depth of rainfall in thousands of the total for the 24 hours:								
Year	108	113	112	112	155	165	132	103
Oct.-Mar	120	122	126	117	137	143	123	112
Apr.-Sept	96	104	96	106	174	188	143	93
Winds W-N	161	143	123	112	143	128	111	79
Winds N-E	95	110	106	109	145	158	133	144
Winds E-S	57	70	103	79	165	207	188	131
Winds S-W	91	105	107	119	161	179	135	103

When, for the eight 3-hour intervals, the mean probability of rainfall, its intensity, and degree of persistence are known, it is possible to deduce the proportion of rain collected and the probability of a fall of rain within each interval. The diurnal variations of these two elements have, like that of the probability of rain at the different hours, a form differing according to the direction of the wind.

These results prove that the diurnal variation of rainfall is due to two different causes—the currents of daytime convection and the nightime cooling. The first produce the showers and vary as the intensity of the rainfall. The second, which gives longer period of rainfall, seems to be related to what we have called *the degree of persistence* of rainfall. According to the direction of the wind, one or the other of these two causes predominates.

European weather in August—London heat wave.—London experienced the warmest night ever recorded in the last week of August, with a temperature of 84° in the shade in the morning and a maximum of 88° in the afternoon. The heat wave extended over the British Isles, parts of Europe, and the African coast.

The heat overcame the British tradition of never discarding vest or even coat. When the temperature reached 92° at 3 p. m. August 27 stockbrokers in shirt sleeves but still wearing their top hats astonished the business section of the city.

France also suffered from the heat; a maximum temperature of 95° in Paris and 102° in the Seine Valley were recorded.

Cloudy, chilly, and wet.—While crops have burned in the United States, they have molded and rotted in parts of Europe. In Germany August has been the wettest month of that name in 20 years; a protracted rainy period which followed the prolonged June drought retarded the progress of all German crops.

Reports from various countries where harvesting operations are about to begin show that Russia and Rumania probably will be the only ones with surplus cereal crops for export, while England, France, Italy, Germany, and Austria will have subnormal yields of wheat, rye, oats, and barley.

Torrential rains in northern China.—While the United States is still in the grip of an unprecedented drought, news dispatches tell of torrential rains in northern China and an estimated loss of 1,000 lives by drowning in the flooded area. The rains also interfered with fighting between Nationalist troops and their foes in the Province of Shantung. The greatest loss of live and damage to property occurred in the low country between Peiping and Mukden, in Manchuria, during the first 10 days of August.

[1] Note by M. Louis Besson, presented by M. Bigourdan. *Comptes Rendus*, des séances de l'Academie des Sciences, tome 191, No. 3, July 21, 1930, p. 146–148. Translated by Katharine B. Clarke.

Torrential rains occurring in the barren country about 120 miles from Kalgoorlie, Australia, are reported as having washed away a few inches of surface soil, disclosing gold-bearing quartz reefs which are expected to prove the richest Australian find in many years.

A dispatch from Capetown, South Africa, under date of August 12, reports the end of South Africa's drought, due to a severe storm that swept over many parts of the union, attended by gales of wind and heavy rain. Rain fell even upon Little Namaqualand district of Cape Colony, parts of which had experienced a phenomenal drought that lasted five years.—*A. J. H.*

International ice observation and ice-patrol service in the North Atlantic Ocean, season of 1929.[2]—The ice patrol report is more than a record of icebergs, currents, and navigation; it is full of the climate of a chilly, foggy region. In fact, it is the fogginess of the climate that makes the patrol necessary. And on account of this fog the patrol can not remove the menace of icebergs in steamer lanes, for with fog prevailing a third of the time, sometimes for days together, icebergs, traveling often 24 or more miles a day, can slip unseen into the path of steamers.

The interesting running account of the patrol is supplemented by special discussions, the first of which is "Weather." (Pp. 67–74, figs. 2–5.) The mean air temperature rose from 40° in April and 43° in May to 51° in June and 60° in July. The sea-surface temperature rose nearly as much, but averaged a few degrees lower. The lowest and highest air temperatures were 30° and 73°. Weather diagrams, on polar coordinates, show the details of daily pressure winds and visibility. The reduced frequency of gales from spring to summer is a striking feature of the climate. Local differences in fogginess and air temperature correspond closely to those of sea-surface temperature and to the direction of the wind.

The warm air of southerly winds usually becomes chilled and foggy over the cold water, while the cold air of northerly winds frequently makes a "steam" fog over the warm water of the Gulf Stream. The sea temperature differs by 25 or more degrees F. in a short distance. To use its time most effectively the patrol ship is usually directed into the fog-free warm water during periods of southerly winds and into the cold water when northerly winds blow. In its operation the weather reports received frequently from many ships assist.—*C. F. B.*

Scirocco invasions of central Europe, by Martin Herrmann.[3]—Tropical continental air from the Sahara invades central Europe not infrequently, it seems. Air trajectories, and identification by potential temperature and other characteristics, as well as occasional falls of Sahara dust, are ample proof of the movements of large quantities of Sahara air over Europe. Though this air is dry for its high temperature, the absolute humidity is high enough for heavy, warm front rains, and even for thunderstorms, owing to the super-wet-adiabatic lapse rate (0.8° C. per 100 m.) in the air from the Sahara. Rains that flood the Po Valley are ascribable to Sahara air ascending on a 1 per cent gliding slope, while more moderate scirocco rains in central Europe have an intensity that would attend ascent on a slope half as steep.—*C. F. B.*

[2] U. S. Treasury Department, U. S. Coast Guard, Bull. No. 18, Washington, 1930. 141 pp., 17 pl., 33 figs. tables.

[3] Herrmann, Martin, Scirocco-Einbrüche in Mitteleuropa (Ein Beitrag zur Analyse der 5-b-Depressionen vom 25. April und 16. Mai, 1926). Veröff. d. Geoph. Inst d. Univ. Leipzig. 2d ser. of spec. works, vol. 4, p. 181–252, 6 pl., tables, bibliog.

Meteorological summary for Chile, May, 1930 (by J. Bustos Navarrete, Observatorio del Salto, Santiago, Chile).—This month was characterized by weak atmospheric circulation over the Pacific Ocean and generally dry weather over Chile.

The most important depressions, those accompanied by unsettled weather and rain, were charted as follows: 1st–4th, crossing the extreme south; 12th–13th, over the central zone; and 23d–24th, over the southern region.

Anticyclones were mapped on the 4th–6th, 21st–23d, and 27th–31st; all moved from latitude 45 S. toward the central region of Argentina.—*Translated by W. W. R.*

Meteorological summary for Chile, June, 1930 (by J. Bustos Navarrete, Observatorio del Salto, Santiago, Chile).—With June there came a noticeable intensification in the circulation of the atmosphere over the Pacific Ocean, which caused increase in rainfall in the central and southern regions of Chile.

The depressions of the 3d–7th and 10th–13th brought heavy storms over the region from Aconcagua to Magallanes. Those of the 16th–20th and 24th–25th were of lesser intensity and crossed the extreme southern area.

Important anticyclonic centers were charted on the 2d–3d and 29th–30th; the first moved from south of Chile toward Argentina, the second formed near northern Chile, advanced southward, and then recurved toward Argentina. The formation and movement of the latter area caused an intense cold wave, with temperatures of −10° C. (14° F.) in the cordillera of Los Andes.—*Translated by W. W. R.*

Meteorological summary for Chile, July, 1930 (by J. Bustos Navarrete, Observatorio del Salto, Santiago, Chile.)—A greater activity in atmospheric circulation was evidenced by the more frequent occurrence of depressions and anticyclones. There was a general increase in rain in central and southern Chile.

The most important anticyclones were charted as follows: 1st–9th, moving from southern Chile toward Argentina, Uruguay, and Brazil, accompanied by a severe cold wave; 14th–17th, advancing from Magallanes toward northern Argentina and Brazil; 21st–22d, crossing central Chile toward Argentina; and lastly, 24th–30th, paralleling the cordillera from southern Chile to the Bolivian highland. The passage of each of these HIGHS was attended by fair weather, cold wave, and freezing.

The days on which conditions were determined by the presence of depressions were the following: 7th–11th, 14th–15th, 16th–19th, 22d–23d, and 26th–30th. The first storm crossed the extreme southern region and brought general rain in southern and central Chile; the second appeared off Coquimbo; the third advanced from the extreme south to central Chile, attended by high winds, rain, and snow; the fourth and fifth crossed the extreme south and were accompanied by rain and snow, high winds, and displays of electricity.—*Translated by W. W. R.*